SUBSTITUTE SPECIFICATION

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A METHOD OF PRODUCING PACKAGING MATERIAL IN THE FORM OF A CONTINUOUS LAMINATE WEB

TECHNICAL FIELD

The present invention relates to a method of producing packaging material in the form of a continuous laminate web and of the type which comprises a core layer of paper or cardboard whose one face displays a layer disposed outside the core layer and including, on the one hand, a metal foil, preferably aluminum foil, and, on the other hand, a plastic coating disposed outside the metal foil layer and including one or more thermoplastic materials, the core layer being covered throughout its entire surface by said layer, while the layer extends over the edges of the core layer along selected portions.

BACKGROUND ART

Packaging containers of the single-use disposable type, in particular such packages for the storage of liquids, are often produced from a packaging material including a core layer of paper which is coated with thermoplastic material and aluminum foil. The packaging material is often provided in the form of webs rolled onto magazine reels, the webs, after being paid out from their magazine reels, being reformed by folding into packaging containers in automatic packaging machines. A common package of this type is that which is marketed under the Trademark TETRA BRIK®

and which is preferably employed for liquid contents such as milk, fruit juice, etc. This package is produced in automatic packaging and filling machines in such a manner that the web paid out from the magazine reel is reformed into a tube by the edges of the web being united in an overlap seam or joint, whereafter the thus formed tube is filled with the intended contents and separated into individual packages by repeated transverse seals disposed in spaced apart relationship from one another and at right angles to the tube. Once the supplied contents have thus been enclosed in sealed sections of the tube, these sections are separated from the tube by incisions in the above-mentioned transverse sealing zones. The separated tube sections are thereafter formed by folding along crease lines disposed in the packaging material, to form packaging containers of the desired configuration, for example, parallelepipedic containers.

Packages of this type are often fitted with opening arrangements in the form of holes, apertures or slits made in the packaging material and covered by tear-off strips which are normally referred to as "pull-tabs". When the contents include a sterile product such as sterilized milk or of an acidic product such as, for instance, orange juice, the package is often manufactured from a packaging laminate which includes an aluminum foil layer making the package extremely tight to penetration by gases such as, for example, oxygen gas which might oxidize the contents of the package with resultant deterioration in quality. In order to achieve the

desired tightness, it is of major importance that the aluminum foil layer is not ruptured or damaged in the package forming operation or on manufacture of the packaging material. In addition, for the function of the pull-tab opening, it is vital that the aluminum foil layer possesses extremely good adhesion at the region around the opening hole over which the pull-tabs are arranged to be applied (in a manner which will be described in greater detail hereinbelow) since otherwise the opening operation might easily be unsuccessful, since the covering strip which has been applied over the intended opening can be torn off without the inside coating of plastic and aluminum foil being properly opened.

One object of the present invention is to treat and prepare in a simple and efficient manner a packaging material web of the above-outlined type in such a way that the edge of the packaging material web is effectively sealed off with an upper plastic film disposed around the edge zone. It is known in the art to seal-off liquid absorbent material edges exposed to the inside of a packaging container with thermoplastic strips which overbridge or are folded around such edges. It is also known in the art, with the same purpose in view, to provide the packaging material web with a so-called fixed edge strip of plastic, i.e., with a plastic strip which projects from the web edge of a cardboard web and which may be folded around the edge and sealed against its opposing side. Such a "fixed edge strip" is obtained by positioning cardboard webs beside one another so that a slot or gap is

formed between the webs, whereafter the webs and these slots are jointly covered over with a plastic foil or, in certain cases, with a plastic foil and an aluminum foil, whereafter the covered webs are separated by the means of an incision in the region of the slot for forming a projecting, fixed strip. One drawback has hitherto been that it has not been possible to achieve adhesion - or in any event only poor adhesion - between, for example, an aluminum foil layer and a plastic layer in the region of such slots, since the aluminum foil and the plastic layer cannot be compressed together within the region of the incision because of the differing thicknesses of the material and the consequential difficulty for the pressure rollers to compress together the material within the region of the slot. It has proven particularly difficult to compress the aluminum foil layer and the plastic layer adjacent the defining edges of the slots for the same reasons. However, the employing the process according to the present invention, this drawback is obviated in that a plastic/aluminum foil layer is first produced in which the components in the laminate display good adhesion to one another, and this plastic/aluminum foil layer is then laminated to the above-mentioned side-by-side disposed webs of the core material layer which includes paper or cardboard.

Using prior art technology, packaging material of the type considered here can be produced by applying, in a plurality of separate lamination operations, the different layers, i.e., the aluminum foil layer, the inner plastic layer and so on to the core layer of paper or cardboard, and

such a lamination process functions excellently in those cases when the core layer is not provided with holes, apertures or slots, i.e., the regions where the coating layers extend over or beyond edge zones of the core layer. Difficulties arise, however, in coating an aluminum foil against a core layer web of paper or cardboard in which the core layer is provided with holes, apertures or slots. This is because the aluminum foil must, in connection with the lamination (in which the bonding lamination layer often includes a thin extruded thermoplastic film), be pressed against the core layer substrate with the aid of a nip roller or soft pressure roller in order that sufficient adhesion between the aluminum foil layer and the core layer can be achieved. Since, in general, the aluminum foil layer is extremely thin (of the order of approx 5 to 10 μ), it will be forced by the nip roller against the edges around the apertures or the slots in the core layer and be partly pressed into these holes or apertures. Since the punched holes, apertures or the like have a relatively sharp edge, there is a risk that the aluminum be ruptured, and in any event the risk occurs that the aluminum foil will become creased around the edges of the apertures or slots and will thereby either be weakened or suffer from poor adhesion between the aluminum foil and the core layer precisely in the edge zones of the holes or apertures. Further, the adhesion between the plastic layer and the aluminum foil layer is poor in the region of these holes or slots, since the pressure of the nip

roller in such regions is limited because of the material thickness reduction in the holes or slots.

These circumstances have constituted a serious problem which has caused ruptures in the aluminum foil layer and thereby insufficient gas tightness in the finished packages, defective opening arrangements because of poor adhesion between the aluminum foil layer and the core layer in the edge zones around the apertures, and poor adhesion between the aluminum foil layer and the plastic layer along those parts where the aluminum foil layer and the plastic layer project out beyond the core layer and, thus, receive no support from the core layer during the compression operation.

SUMMARY OF THE INVENTION

The above-outlined drawbacks are obviated in an efficient manner by the present invention in which the layer of plastic coated aluminum foil disposed against the core layer is formed such that the foil and the least one thermoplastic material are laminated to one another by being brought together surface-to-surface between two rollers, of which one roller is a cooled roller and the other is a roller which is heated to a temperature exceeding the melting temperature of the thermoplastic; the thus formed layer is united with the core layer between two cooled rollers; and a binder or adhesive thermoplastic such as polyethylene is extruded in between the layer and the core layer.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

The features and advantages of the present invention are well understood by reading the following detailed description in conjunction with the drawings in which like numerals indicate similar elements and in which:

Fig. 1 is a schematic view of a laminator for producing packaging material according to an embodiment of the present invention; and

Fig. 2 is a side, cross-sectional view of a laminate according to an embodiment of the present invention provided with a so-called fixed strip; and

Fig. 3 is a schematic view of a laminator for producing packaging material according to another embodiment of the present invention.

DETAILED DESCRIPTION

The apparatus for producing the laminate according to the present invention as schematically illustrated in Fig. 1 includes a magazine reel 1 containing a web 2 of preferably fibrous material, e.g., paper or cardboard, which on its one side may display a thin coating 21 of a thermoplastic material, such as polyethylene.

A magazine reel 3 holds a thin aluminum foil web 4 (5 - 20μ) and a magazine reel 5 holds a prefabricated laminate film 6.

The aluminum foil web 4 and the film 6 are drawn between two cooperating rollers 10 and 12, respectively, the roller 10 including a heatable metal roller (preferably steel), while the roller 12 includes a cooled roller (preferably a rubber roller). The web 7 including the co-laminated

webs 4 and 6 is led over the bending roller 11. A molten thermoplastic film 9 (preferably polyethylene) is extruded from an extruder 8 between the web 7 and the web 2. The web 7 and the web 2 are drawn between a nip roller 14 and yet a further cooled roller 13. The finished laminate 17 is drawn over a further bending roller 15 and is wound onto a magazine reel for accommodating the finished packaging material 16.

In Fig. 2, which shows a greatly magnified cross section of a packaging material 17′ according to the present invention, the base layer of the laminate 2′ formed from the web 2′ is provided with a thin outside coating of thermoplastic 21′. The base layer 2′, is provided with a punched portion 18 and an end edge 20, and is united with a laminate 7′ formed from the web 7 including at least one layer 4′ of aluminum foil formed from the web 4 and one layer of a prefabricated, preferably co-extruded film 6′ formed from the web 6 having an inner side 19 (facing towards the aluminum foil) of EAA (Ethylene Acrylic Acid Ester), and a layer 22 of the polyethylene (preferably Low Density Polyethylene LDPE). A laminating layer 9′, preferably polyethylene, is disposed between the layer 4′ of aluminum foil and the base layer 2′.

The web 6 may be co-extruded as shown in Fig. 3, or prefabricated and wound on the reel 5 as shown in Fig. 1.

As has been mentioned previously, the base layer 2′ of the packaging laminate may contain holes or recesses which constitute opening holes or the like, and packaging material webs of the type contemplated here are similarly also often provided with an edge zone of plastic material which

extends over the edge 20 of the base layer so as to cover the incision edge 20 of the base layer 2′ and protect it against liquid absorption. The technical problems which occur on application of the inside layer 7′ of the packaging web were dealt with and discussed by way of introduction, for which reason the following description will be limited so as to relate to how the material characteristic of the present invention is produced. The web 2 for forming the base layer 2′ of the packaging material is unrolled from the magazine reel 1 and is led in to the nip between a nip roller 14 and a cooled roller 13.

From another magazine reel 3, the thin web of rolled aluminum foil 4 is paid out, this web being united with the web 6 of a prefabricated co-extruded laminate of EAA and LDPE, paid out from another magazine reel 5. The two webs 4 and 6 are united with one another and accommodated between a heated steel roller 10 whose surface temperature is preferably between 150° and 200°C (preferably approx. 150°C), and a cooled roller 12 whose surface is clad with a resiliently yieldable material (e.g., rubber). The two webs 4 and 6 which are brought into contact with the heated roller 10 and the cooled roller 12, respectively, are compressed between the rollers, in which event the aluminum foil (because of the contact with the heated roller 10) transfers heat to the EAA layer of the web 6, this being heated to such a level that it adheres to the aluminum foil 4 while the LDPE layer of the web 6 which is in direct contact with the cooled roller 12 is not heated to the same level as the EAA

layer and moreover the LDPE layer has a melting an plasticizing temperature which exceeds the melting and plasticizing temperature of the EAA layer. The result will be that the webs 4 and 6 are combined to form the continuous united web 7 which displays good adhesion between the aluminum foil layer 4 and the web 6. As seen in Fig. 1, the web 7 is passed over a bending roller 11 and is thereafter passed over the cooling roller 13 into the nip between the cooling roller 13 and the previously mentioned nip roller 14.

With the aid of the extruder 8, a molten plastic film 9, preferably of polyethylene, is extruded in between the web 2 for forming the base layer 2' and the finished laminate web 7, the aluminum foil of the laminated web 7 being turned to face towards the extruder 8. In the nip between the nip roller 14 and the cooling roller 13, the webs 2 and 7 are brought together for the formation of the packaging material web 17 which is led over a bending roller 15 and finally rolled up on a magazine reel 16.

The method of production according to the present invention affords the advantage that the adhesion between the aluminum foil web 4 and the other layers of the laminate will be good and that the aluminum foil layer can be fixed to the web 2 for forming the base layer 2' also around edge zones and apertures of different types without crease formation around the edge zones or poor adhesion between the aluminum foil and the web 2 for forming the base layer 2 occurring around the edge zones.

The method according to the invention constitutes a solution to a technical problem which has long been well-known in the art, and contributes in raising the standard of quality of those packages which are manufactured from the produced laminate in that delamination between aluminum foil and plastic material is avoided, adhesion along edge portions between the material layers included is improved and ruptures and crease formation in, above all, the aluminum foil layer are avoided.

The present invention should not be considered as restricted to that described above and shown on the Drawing, many modifications being conceivable without departing from the spirit and scope of the appended Claims.